

EVALUATION OF $n + W$ CROSS-SECTION DATA UP TO 150 MeV NEUTRON ENERGY

Pavel Pereslavytsev, Ulrich Fischer

Forschungszentrum Karlsruhe

Tungsten is a high priority material for various fusion technology applications. It is the primary candidate for the armour of plasma facing components and is a major constituent of the reduced activation ferritic-martensitic steel Eurofer considered as structural material of future fusion power reactors. In the European Fusion Technology Programme, highest priority has been assigned to high quality data evaluations for the tungsten isotopes. This includes the neutron energy range above 20 MeV to enable intermediate energy calculations of the IFMIF (International Fusion Irradiation Materials Irradiation Facility) neutron source facility which will be used for high fluence irradiations of the Eurofer steel. A corresponding task on the evaluation of neutron cross-sections for the W isotopes has been launched as part of the European Fusion File (EFF) project.

This paper presents results of the evaluations for the $n + W$ reactions up to 150 MeV. The GNASH code was used for the calculation of nuclear reaction cross sections and the ECIS code for the neutron elastic and direct inelastic scattering cross sections. Recent high energy experimental data were taken into account for evaluating the total and nonelastic cross sections. A set of optical model potentials up to 150 MeV was chosen on the basis of detailed comparisons of available experimental data and calculations with ECIS and the SCAT2 code. Both global and local potentials for neutrons, protons, deuterons, tritons and alphas were considered. To improve the neutron emission spectra, collective excitations were also included in GNASH. The Ignatyuk nuclear level densities were used for statistical model calculations. Double-differential cross sections of the emitted particles were calculated on the basis of the Kalbach systematics.

As a general rule, the ENDF/B-VI.8 data were adopted below 20 MeV with some corrections applied to achieve agreement with recent experimental data. Thus complete ENDF data files were prepared for the W isotopes covering the full energy range data up to 150 MeV. The double differential reaction cross sections were represented in the MF=6, MT=5 data format.